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PATENT APPLICATION

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of

Hiroshi YAMAGUCHI

Docket No: Q59329

Appln. No.: 09/656,131

Group Art Unit: 2613

Confirmation No.: 9189

Examiner: Anand S. RAO

Filed: September 06, 2000

For: IMAGE PROCESSING DEVICE, IMAGE PROCESSING METHOD AND RECORDING MEDIUM

SUBMISSION OF APPEAL BRIEF

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith please find an Appeal Brief. The USPTO is directed and authorized to charge the statutory fee of $500.00 and/or all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account. A duplicate copy of this paper is attached.

Respectfully submitted,

Ruthleen E. Uy
Registration No. 51,361

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

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23373
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Date: March 13, 2006

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APPEAL BRIEF UNDER 37 C.F.R. § 41.37

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 41.37, Appellant submits the following:

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I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Fuji Photo Film, Co., Ltd. of Japan, the assignee. The assignment was previously submitted and was recorded on December 19, 2000 at Reel 011358, Frame 0383.

II. RELATED APPEALS AND INTERFERENCES

To the knowledge and belief of Appellant, the Assignee, and the Appellant's legal representative, there are no other appeals or interferences before the Board of Appeals and Interferences that will directly affect or be affected by the Board's decision in the instant Appeal.

III. STATUS OF CLAIMS

Claims 1-24 are pending in the present application and stand finally rejected.

Based on the Advisory Action of January 4, 2006 and the Office Action of July 13, 2005, claims 1, 2, 4-7, 11, 13-15, 17-18, 20 and 21 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Edgar (U.S. Patent No. 5,266,805; hereinafter "Edgar").

Claims 16 and 19 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Hiramatsu (U.S. Patent No. 4,933,983; hereinafter "Hiramatsu").

Claim 12 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Edgar in view of Tung (U.S. Patent No. 3,758,193; hereinafter "Tung").

Claim 3 has been objected to.

Claims 8-10 and 22-24 have been allowed.

No other ground of rejection or objection is currently pending.

A copy of the pending claims on appeal is set forth in an attached Appendix.

IV. STATUS OF AMENDMENTS

Amendments to the claims were submitted in an Amendment Under 37 C.F.R. § 1.111 filed April 20, 2005 in response to the Non-final Office Action dated February 4, 2005. A Response Under 37 C.F.R. § 1.116 was filed October 7, 2005, in response to the Final Office Action dated July 13, 2005. An Examiner Interview was conducted on September 9, 2005, in which claim 3 was objected to and claims 22-24 were allowed. In the Advisory Actions dated December 15, 2005 and January 4, 2006, the Examiner states that the reply filed October 7, 2005, has been considered but did not place the application in a condition for allowance.

All arguments are believed to have been previously entered and made of record.

A copy of the claims on appeal is set forth in an attached Appendix.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

Appellant's invention as recited in independent claims 1, 11, 13, 16, 17, 18, 19 and 20 is related to image processing devices, image processing methods, and recording mediums for correcting defective portions in an image.

Surfaces of photographic film often become scratched or dust attaches to surfaces of the photographic film resulting in defective output images. See page 1, line 14 to page 2, line 1. In the past, various correction methods, such as interpolation, brightness adjustment, and vignetting, have been considered for correcting defect portions. See page 3, lines 17-25. However, each of the correction methods has a weak point.

With respect to interpolation, if a change in density of an image is complex, it is difficult to calculate interpolation. See page 4, lines 3-22. With respect to brightness adjustment, which only adjusts brightness, it is difficult to adjust the color in a location of foreign matter or scratches on a film. In addition, brightness adjustment is dependent upon changes in the amount of transmitted light in a non-visible light region, the variation in the change in the amount of transmitted light could remain as a defect portion. See page 4, line 23 to page 5, line 21. With respect to the vignetting method, since defect portions are vignetted by reducing high frequency components of the spatial frequency in the defect portion and the area surrounding the defect portion, vignetting is not suitable for deep scratches or if large foreign matter is present. In particular, the degree of vignetting must be enlarged resulting in decreased image quality. See page 5, line 22, to page 6, line 7.

Therefore, the exemplary embodiments of the present invention provides an image processing device, image processing method and recording medium capable of accurately correcting all of various type of defect portions.

Claim 1

An image processing device comprising (see for example, Fig. 1, film scanner 12 and image processing device 14): a detecting device (see for example, Fig. 1, control section 42) for detecting defect portions in an image represented by electronic information (see for example, page 32, lines 5-9; page 37, line 24-page 38, line 3; page 44, line 19 to page 45, line 22; Fig. 3, operation 102); a deciding device (see for example, Fig. 1, control section 42) for selecting a correction method from among a plurality of types of correction methods (e.g. interpolation, brightness adjustment, vignetting) for correcting a defect portion, or for deciding a range of application of each of at least two correction methods correcting a defect portion (see for example, page 53, lines 15-25; Fig. 3, operation 108); and a correction device (see for example, image processor 40; page 39, lines 7-9; page 66, lines 8-16) for correcting defect portions in the electronic information by applying the correction method selected by the deciding device, or for correcting defect portions in the electronic information by applying the at least two methods in the application ranges decided by the deciding device (see for example, page 54, line 1 to page 62, line 8; Fig. 3, operations 110-116).

Claim 11

An image processing device (see for example, Fig. 1, film scanner 12 and image processing device 14) for use in producing electronic information representing an image

recorded on image recording material, the image processing device comprising: a calculation device (see for example, page 37, lines 15-23; Fig. 1, control section 42) for calculating a brightness alteration amount for correcting a defect portion in the image based on an amount of transmitted or reflected non-visible light in an area adjacent to the defect portion when light is irradiated onto the image recording material (see for example, Fig. 10 and Figs. 4A, 4B and 4C) and a difference in the refractive indexes of visible light and non-visible light in the image recording material (see for example, page 42, line 10 to page 45, line 22); and a correction device (see for example, control section 42; image processor 40; page 38, lines 3-7) for correcting electronic information representing the image such that the brightness of the defect portion of the image represented by the electronic information changes by an amount calculated by the calculation device (see for example, Fig. 10; page 61, line 24 to page 64, line 12).

Claim 13

An image processing method, comprising the steps of: detecting a defect portion in an image represented by electronic information (see for example, page 32, lines 5-9; page 37, line 24-page 38, line 3; page 44, line 19 to page 45, line 22; Fig. 3, operation 102); selecting, based on a characteristic of the defect portion, a correction method from a plurality of correction methods (e.g. interpolation, brightness adjustment, vignetting) for correcting the defect portion, or a range of application of each of at least two correction methods correcting the defect portion (see for example, page 53, lines 15-25; Fig. 3, operation 108); and applying the selected correction method, or the at least two correction methods in the selected application ranges, to

the electronic information representing the image (see for example, page 54, line 1 to page 62, line 8; Fig. 3, operations 110-116).

Claim 16

An image processing method comprising the steps of: calculating image feature amounts for defect portions in an image represented by electronic information along a plurality of different directions running from within each defect portion (see for example, Fig. 8; page 55, lines 14-23); calculating correction values for correcting the defect portions by interpolation from information through areas of the image for each defect portion for each of the plurality of directions (see for example, Fig. 4C; page 59, lines 7-13); determining final correction values for each of the directions based on the image feature amounts in each of the directions; and correcting the defect portions in the electronic information using the final correction values (see for example, Figs. 7A and 7B; page 55, line 11 to page 61, line 14).

Claim 17

An image processing method for correcting electronic information representing an image having a defect portion, wherein the image is recorded on image recording material, the method comprising the steps of: irradiating the image recorded on image recording material with non-visible light (see for example, page 42, line 10 to page 45, line 22); receiving the light after irradiation of the image; calculating a brightness alteration amount for correcting a defect portion in the electronic information representing the image, based on the amount of non-visible light received from the image in the step of receiving, in an area adjacent to the defect portion, and on the difference in refractive indexes of visible light and non-visible light in the image recording

material (see for example, Fig. 10 and Fig. 4B); and correcting electronic information representing the image so that the brightness of the defect portion in the electronic information changes by an amount calculated in the step of calculating a brightness alteration (see for examiner, page 47, lines 14-24).

Claim 18

A recording medium comprising program steps recorded thereon, which when used to program a computer, cause the computer to execute the following steps (see for example, page 28, lines 6-12): detecting a defect portion of an image represented by electronic information; based on a characteristic of the defect portion (see for example, page 32, lines 5-9; page 37, line 24-page 38, line 3; page 44, line 19 to page 45, line 22; Fig. 3, operation 102), selecting a correction method for correcting the defect portion from a plurality of types of correction methods (e.g. interpolation, brightness adjustment, vignetting), or ranges of application of each of at least two correction methods for correcting the defect portion; and applying the selected correction method to the electronic information, or correcting the defect portion by applying the at least two methods to the electronic information in the selected application ranges (see for example, page 54, line 1 to page 62, line 8; Fig. 3, operations 110-116).

Claim 19

A recording medium comprising program steps recorded thereon, which when used to program a computer, cause the computer to execute the following steps (see for example, page 28, lines 13-25): calculating image feature characteristics for defect portions in an image represented by electronic information, along a plurality of different directions running from

within each defect portion (see for example, Fig. 8); calculating correction values for correcting the defect portions by interpolation from information through areas of the image in a plurality of directions for each defect portion (see for example, Fig. 4C; page 59, lines 7-13); determining final correction values from the correction values for each of the directions based on the image feature characteristics in; and applying the final correction values to the electronic information to correct the defect portions (see for example, Figs. 7A and 7B, page 55, line 11 to page 61, line 14).

Claim 20

A recording medium comprising program steps recorded thereon, which when used to program a computer, cause the computer to execute the following steps (see for example, page 29, line 9 to page 30, line 4): calculating a brightness alteration amount for correcting a defect portion in electronic information representing an image recorded on a recording medium, based on an amount of transmitted or reflected non-visible light in an area adjacent to the defect portion when non-visible light is irradiated onto the image recording material, and on the difference in refractive indexes of visible light and non-visible light in the image recording material (see for example, Fig. 10; Fig. 4B; page 42, line 10 to page 45, line 22); and correcting the brightness in the electronic information so that the brightness of the defect portion changes by the amount calculated in the step of calculating a brightness alteration amount (see for example, page 47, lines 14-24).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1, 2, 4-7, 11, 13-15, 17-18, 20 and 21 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Edgar

2. Claims 16 and 19 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Hiramatsu

3. Claim 12 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Edgar in view of Tung

VII. ARGUMENT

1. Claims 1, 2, 4-7, 11, 13-15, 17-18, 20 and 21 are patentable over Edgar

Claims 1-7, 11, 13-15, 17-18, 20 and 21 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Edgar.

Edgar pertains to a system and method for image recovery. An image is sequentially scanned with infrared, red, green and blue light in order to obtain an infrared 20, red 22, green 24 and blue 26 image of the film. Col. 5, line 62 to col. 6, line 2. The desired image does not appear in the infrared image 20 but imperfections appear on all four of the images 20-26 in a substantially equal manner. Col. 6, lines 32-38. A subtractive process is employed to reconstruct an image from the images 20-26 into a new image where the imperfections are reduced or eliminated. Col. 6, lines 40-59. By subtracting out the effects of the imperfections, an accurate map of the location of the imperfections, to which conventional fill-in algorithms are applied, is determined. Col. 3, line 57 to col. 4, line 14.

For the rejections over Edgar, the claims should be considered in at least the three separate groupings as indicated below and thus should not stand or fall together in view of the disparate recitations and reasons for allowability over Edgar.

Group 1: Claims 1, 13, and 18

The Examiner asserts that Edgar col. 5, lines 50-55 teaches "a deciding device for selecting a correction method from among a plurality of types of correction methods for correcting a defect portion," as recited in claim 1 (See Office Action of July 13, 2005, para. 6).

The respective column and lines cited by the Examiner disclose that the system and method described in the Edgar patent may be used in conjunction with fill-in algorithms to automatically render an imperfection effectively invisible because their locations and boundaries are now more precisely identified, as a result of the system and method disclosed in Edgar, without unnecessarily losing image detail.

However, there is no indication of **a deciding device** to select a correction method, nor is there any indication of a plurality of types of correction methods to be selected at a given time. In particular, although Edgar discloses that fill-in algorithms can be used in conjunction with the system and method of Edgar, there is no indication that **a deciding device** selects the fill-in algorithm to be used. As described in Edgar, col. 12, lines 36-40, and as discussed during the interview of September 9, 2005, Edgar appears to disclose an interpolate box 126 for performing interpolation and a separate divide 124 for adjusting pixel values. Therefore, assuming *arguendo,* a correction method is selected, **a deciding device** does not select a correction method, as recited in claim 1.

The Examiner further asserts that the fill-in algorithms are applicable to imperfections caused by visible versus non-visible transmissivity (col. 5, lines 60-65), CCD characteristics (col. 10, lines 45-57), and dye characteristics (col. 10, lines 10-35), and depending on the type of defect map generated, the choice of a plurality of method applications is addressed by Edgar (see Office Action of July 13, 2005, para. 6).

The respective column and lines cited by the Examiner disclose the application of a color wheel to separate the information comprising an image 14 and imperfections 16 into a plurality

of individual records, the application of a CCD device, and the use of a less diffuse illumination source. Contrary to the Examiner's assertions, there is no suggestion of selection of a corrective measure as it appears each correction becomes individually calculated.

In response to Appellant's argument that Edgar does not disclose "deciding a range of application of each of at least two correction methods correcting a defect portion," the Examiner asserts that thresholding the intensity values generates values on the decision tree to generate the application of one or more correction methods, citing col. 8, line 8 and lines 50-67 and col. 9, lines 1-20, in support.

The respective column and lines cited by the Examiner disclose that a component of a program 58 may be control software necessary for generating sequentially the desired red, green, blue and infrared images. In addition, if an infrared pixel does not equal a predetermined value, the pixels associated with this infrared pixel and corresponding location in the frame 10 are considered to be obscured by imperfection. An appropriate fill-in routine can then be executed to replace the respective red, green, blue and infrared pixel values. Although the intensity values of the pixels are compared to a predetermined threshold, there is no indication regarding a range of each of at least two correction methods (fill-in algorithms, as cited by the Examiner) correcting a defect portion.

The Examiner asserts that a correction method is disclosed by Edgar's "intensity of the imperfections," and further in Edgar col. 6, lines 39-58 and col. 6, lines 59-68 (see Office Action of February 4, 2005 at page 2). However, it is unclear how the "intensity of imperfections" teaches a correction method. It appears that the intensity of the imperfections is used to map the

locations of the imperfections. Based on the determined location of the imperfections, a fill-in algorithm is used to correct the imperfection. Consequently, the mere "intensity of imperfections" does not teach a correction method. Further, the respective column and lines cited by the Examiner discuss obtaining an infrared, red, green and blue image in order to map out imperfections. At no point is a correction method disclosed, let alone that a correction method is selected from among a plurality of types of correction methods or a range of application for two correction methods. Moreover, to the extent an intensity of imperfections is known, it invokes a common correction and thus does not comprise selection from a plurality, or selection of a range for plural corrections as claimed.

For at least the above reasons, claim 1 and its dependent claims should be deemed allowable. Since claims 13 and 18 recite similar elements, claims 13 and 18 and their dependent claims should be deemed allowable for at least the same reasons.

Group 2: Claims 11, 17 and 20

The Examiner asserts that Edgar col. 6, lines 59-68, col. 7, lines 1-9 and col. 9, lines 13-53 teach the elements of claim 11 (see Office Action of February 4, 2005 at page 4). The respective column and lines cited by the Examiner disclose that imperfections appear in equal intensity in red, green and blue images and that given the precise location of the imperfections in relation to the infrared image, the imperfections can be corrected. In particular, the exposure and intensity of the pixels at the imperfection areas are increased to obtain an improved image. Col. 9, lines 13-53.

However, there is no teaching or suggestion that "a calculation device for calculating a brightness alteration amount for correcting a defect portion in the image based on an amount of transmitted or reflected non-visible light *in an area adjacent to the defect portion* when light is irradiated onto the image recording material, and *a difference in the refractive indexes of visible light and non-visible light* in the image recording material," as recited in claim 11.

In response to Appellant's argument that Edgar does not disclose "a calculation device for calculating a brightness alteration amount for correcting a defect portion in the image based on an amount of transmitted or reflected non-visible light in an area adjacent to the defect portion when light is irradiated onto the image recording material, and a difference in the refractive indexes of visible light and non-visible light in the image recording material," the Examiner asserts that Edgar inherently teaches this aspect of the claim (see Office Action of July 13, 2005 at page 3). In particular, the Examiner states that "the imperfections of all three visible and the infrared images are used in a subtractive process to generate a final defect map. The subtraction process inherently generates a 'difference image which is due [to] the different refractive indexes of visible and non-visible light.'"

However, assuming *arguendo*, Edgar inherently teaches a difference in the refractive indexes of visible light and non-visible light in the image recording material, the mere mapping of a defective image does not teach or suggest **calculating a brightness alteration amount** for correcting a defect portion in the image based on an amount of transmitted or reflected non-visible light in an area adjacent to the defect portion when light is irradiated onto the image recording material. In particular, Edgar does not appear to be directed to brightness, let alone

calculating a brightness alteration amount for correcting a defect. Therefore, Edgar does not teach all of the limitations of claim 11.

For at least the above reasons, claim 11 should be deemed allowable. Since claims 17 and 20 recite similar elements, claims 17 and 20 should also be deemed allowable for at least the same reasons.

Group 3: Claim 21

Claim 21 describes a correction via vignetting where image information is corrected by reducing high frequency components of spatial frequency of a defect portion and adjacent areas. The Examiner cites the general use of light-shielding, pixel correction for uneven lighting and color filtering to teach this aspect of the claim. Such general teachings do not disclose or suggest the high frequency components of spatial frequency and adjacent area are processed, as described by claim 21. Consequently, claim 21 should be deemed allowable.

2. Claims 16 and 19 are patentable over Hiramatsu

Claims 16 and 19 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Hiramatsu (U.S. Patent No. 4,933,983).

However, in the Interview Summary of September 9, 2005, the Examiner indicated that claim 8 and its dependent claims are allowable. Further, Appellant submits that claims 16 and 19 recite elements similar to claim 8, therefore Appellant requests that claims 16 and 19 also be deemed allowable.

Claim 16 recites "calculating image feature amounts for defect portions in an image represented by electronic information along *a plurality of different directions running from within each defect portion.*"

The Examiner asserts that this aspect of the claim is disclosed in Hiramatsu col. 23, lines 12-50, col. 29, lines 60-68 and col. 30, lines 1-42. Col. 23, lines 12-50 discloses that the addresses of defects in a main scan line are fed from a defect map circuit 518 into a defect correction circuit 512. The length of the defect in the main scan direction is then determined. If the defect is short, the defect can be corrected by substituting the data with data of preceding picture elements or data in following picture elements or by linear interpolation. If the defect is long, the defect can be corrected by substituting video data of a preceding line by adjacent data in the direction of the subscan.

Col. 29, lines 60-68 and col. 30, lines 1-42 disclose a defect correction procedure. If the defect is short (two or less picture elements) then the defect is replaced with the picture element immediately before the defect. If the defect is long (3 or more picture elements) the first two picture elements of the defect are treated as short defects and are substituted with data from the picture element before the data. The defective data corresponding to the third or more picture element is regarded as a long defect and is replaced with preceding scan data. However, there is no indication that image features are calculated in a plurality of different directions from within defect portions. Further, there is no teaching or suggestion that a final correction value is obtained based on amounts of image features of each direction calculated by the feature amount calculation device.

For at least the above reasons, claim 16 should be deemed allowable. Since claim 19 recite similar elements, claim 19 be deemed allowable for at least the same reasons.

3. Claim 12 is patentable over Edgar in view of Tung

Claim 12 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Edgar in view of Tung. Claim 12 should be deemed allowable by virtue of its dependency to claim 1 for the reasons set forth above. Moreover, Tung does not cure the deficiencies of Edgar.

The Examiner states that Edgar does not disclose calculating a high frequency ratio and cites Tung col. 1, lines 55-63 and claim 1, to cure the deficiency. Further, the Examiner states that is it well known to one of ordinary skill in the art that this ratio could be used in order to see how much light is being affected by defects and it could then be used in a calculation to change the intensity.

Tung discloses an infrared-transmissive, visible-light-absorptive retro-reflector such as that used in retro-reflective signs, labels and coatings. See col. 1, lines 9-19. As opposed to the prior art, the retro-reflector disclosed in Tung reflects infrared radiation with good efficiency. The retro reflector includes a thin infrared-transmissive visible light absorptive layer which comprises an infrared-transmissive film and solid discrete pigments particles. The pigment particles lead to a good transmission of infrared radiation while substantially absorbing visible light. The ratio of infrared radiation transmitted to the combined total of infrared radiation and visible light transmitted is at least 75% or more than 90%. See col. 1, lines 55-63.

However, there is no teaching or suggestion in Tung of extracting high frequency components, let alone that a feature amount is calculated based on "one of the type of image recording material and by calculating a ratio of a value obtained when high frequency components are extracted from a change in the amount of transmitted or reflected non-visible light in an area adjacent to the defect portion when non-visible light is irradiated onto the image recording material and a value obtained when high frequency components are extracted from a change in an amount of transmitted or reflected visible light in an area adjacent to the defect portion when visible light is irradiated onto the image recording material," as recited in claim 12.

Moreover, it would not be obvious to one of skill in the art to combine the retro-reflector for signs of Tung with the film defect mapping system of Edgar.

In response to Appellant's argument that Tung does not disclose extracting high frequency components as recited in claim 12, the Examiner asserts that Tung is being cited only for disclosing that a calculation for high frequency is performed. In addition, the Examiner's asserts that col. 10, lines 60-67 and col. 11, lines 1-20 of Edgar disclose the manipulation of high frequency components for imperfection generation.

However, in determining a motivation for obviousness, the Examiner must look at the references as a whole, as to what they would teach to one of ordinary skill in the art. Tung does not teach or suggest extracting high frequency components. In addition, there is no teaching or suggestion in Tung that a feature amount is calculated based on "one of the type of image recording material and by calculating a ratio of a value obtained when high frequency components (which the Examiner asserts is disclosed in Tung) are extracted from a change in the

amount of transmitted or reflected non-visible light in an area adjacent to the defect portion when non-visible light is irradiated onto the image recording material and a value obtained when high frequency components are extracted from a change in an amount of transmitted or reflected visible light in an area adjacent to the defect portion when visible light is irradiated onto the image recording material."

Therefore, assuming one of skill would be motivated to combine the teachings of Tung with Edgar, the combination would still fail to disclose all the claimed elements. In addition, although Edgar discloses softening an image and possibly requiring a software boost of high spatial frequencies to renormalize it to the visible acutance, there is no teaching or suggestion of extracting high frequency components as recited in claim 12.

For at least the above reasons, claim 12 should be deemed allowable.

VIII. CONCLUSION

Unless a check is submitted herewith for the fee required under 37 C.F.R. §41.37(a) and 1.17(c), please charge said fee to Deposit Account No. 19-4880.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

Ruthleen E. Uy
Registration No. 51,361

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: March 13, 2006

CLAIMS APPENDIX

CLAIMS 1, 2, 4-7, and 11-21 ON APPEAL:

1. An image processing device comprising:

(a) a detecting device for detecting defect portions in an image represented by electronic information;

(b) a deciding device for selecting a correction method from among a plurality of types of correction methods for correcting a defect portion, or for deciding a range of application of each of at least two correction methods correcting a defect portion; and

(c) a correction device for correcting defect portions in the electronic information by applying the correction method selected by the deciding device, or for correcting defect portions in the electronic information by applying the at least two methods in the application ranges decided by the deciding device.

2. The image processing device according to claim 1, wherein the electronic information represents an image recorded on image recording material, and the detection device detects defect portions in the image from data obtained from irradiating the image recording material on which the image is recorded with non-visible light, and photoelectrically converting non-visible light after irradiation of the image therewith to produce said data.

3. (allowable): The image processing device according to claim 1, wherein the deciding device selects the correction method or decides the application ranges using at least one characteristic of the defect portion selected from the group consisting of: a correlation of density

changes in each component color in an area adjacent to the defect portion; density distribution in areas surrounding the defect portion of the image; an information as to whether the defect portion is present within a principal area of the image or not; and extent of overlap of the defect portion with a principal area of the image.

4. The image processing device according to claim 2, wherein the deciding device selects the correction method or decides the application ranges based on at least one of an amount of transmitted or reflected non-visible light in an area adjacent to the defect portion, and a correlation between a change in an amount of transmitted or reflected non-visible light in an area adjacent to the defect portion when the non-visible light is irradiated onto the image recording material, and a change in an amount of transmitted or reflected visible light in an area adjacent to the defect portion when visible light is irradiated onto the image recording material.

5. The image processing device according to claim 1, wherein the plurality of types of correction methods include an interpolation method in which information for correcting a defect portion is obtained by interpolation from information in an area surrounding the defect portion, and a brightness adjustment method in which image information is corrected such that the brightness of a defect portion changes.

6. The image recording device according to claim 2, wherein when light of a predetermined plurality of wavelength regions from among non-visible and visible light regions is irradiated onto the image recording material, then if the amount of non-visible transmitted light in the defect portion is less than the amount of non-visible transmitted light in an area surrounding the defect portion, and if the amount of transmitted light of at least one wavelength

region from among the plurality of wavelength regions in the defect portion is greater than the amount of transmitted light in the area surrounding the defect portion, the deciding device selects as the correction method an interpolation method in which information for correcting a defect portion is obtained by interpolation from information in an area surrounding the defect portion.

7. The image recording device according to claim 2, wherein when light of a predetermined plurality of wavelength regions from among non-visible and visible light regions is irradiated onto the image recording material, then if the amount of any of non-visible transmitted light and transmitted light of the plurality of wavelength regions in the defect portion is less than the amount of any of non-visible transmitted light and transmitted light of the plurality of wavelength regions in an area surrounding the defect portion, the deciding device selects as the correction method a brightness adjustment method in which image information is corrected such that the brightness of the defect portion changes.

8. (allowed): An image processing device comprising:

(a) a feature amount calculation device for use with electronic information representing an image having a defect portion, the feature amount calculation device being for calculating respective amounts of image features in a plurality of different directions from within defect portions;

(b) an individual correction value calculation device for obtaining interpolation correction values for correcting the defect portion from information through areas of the image in each of the plurality of directions;

(c) a final correction value calculation device for obtaining, based on amounts of image features of each direction calculated by the feature amount calculation device, a final correction value from correction values calculated for each direction by the individual correction value calculation device; and

(d) a correction device for correcting the defect portion in the electronic information representing the image, using a final correction value calculated by the final correction value calculation device.

9. (allowed): The image processing device according to claim 8, wherein, as the image feature amount, the feature amount calculation device calculates for each of a plurality of directions at least one of: a density change in the image along a predetermined direction; a change in an amount of non-visible light along a predetermined direction transmitted through the image recording material or reflected by the image recording material when non-visible light is irradiated onto an image recording material on which an image represented by the image information is recorded; a number of defect pixels present on the image within a fixed distance along the predetermined direction; and a distance traced along the image to a point in a predetermined direction at which normal pixels begin to appear, which do not correspond to a defect portion.

10. (allowed): The image processing device according to claim 8, wherein at least one of the feature amount calculation device and the individual correction value calculation device performs for each of the plurality of directions a calculation to determine the image feature amount or the correction value in a range as far as to a point, when tracing along the

image in a predetermined direction, at which a fixed number of normal pixels begin to appear, which do not correspond to a defect portion.

11. An image processing device for use in producing electronic information representing an image recorded on image recording material, the image processing device comprising:

(a) a calculation device for calculating a brightness alteration amount for correcting a defect portion in the image based on an amount of transmitted or reflected non-visible light in an area adjacent to the defect portion when light is irradiated onto the image recording material, and a difference in the refractive indexes of visible light and non-visible light in the image recording material; and

(b) a correction device for correcting electronic information representing the image such that the brightness of the defect portion of the image represented by the electronic information changes by an amount calculated by the calculation device.

12. The image processing device according to claim 11, wherein the calculation device acquires the feature amount based on one of the type of image recording material and by calculating a ratio of a value obtained when high frequency components are extracted from a change in the amount of transmitted or reflected non-visible light in an area adjacent to the defect portion when non-visible light is irradiated onto the image recording material and a value obtained when high frequency components are extracted from a change in an amount of transmitted or reflected visible light in an area adjacent to the defect portion when visible light is irradiated onto the image recording material.

13. An image processing method, comprising the steps of:

(a) detecting a defect portion in an image represented by electronic information;

(b) selecting, based on a characteristic of the defect portion, a correction method from a plurality of correction methods for correcting the defect portion, or a range of application of each of at least two correction methods correcting the defect portion; and

(c) applying the selected correction method, or the at least two correction methods in the selected application ranges, to the electronic information representing the image.

14. The image processing method according to claim 13, wherein the electronic information represents an image recorded on image recording material, and the step of detecting a defect portion includes the sub-steps of:

(e) irradiating the image with non-visible light;

(f) photoelectrically converting non-visible light after irradiation of the image therewith, into electronic data; and

(g) detecting the defect portion based on the electronic data.

15. The image processing method according to claim 13, wherein the step of selecting is performed using, as amounts of features of the defect portion in electronic information representing the image, at least one of a correlation of density changes in each component color in an area adjacent to the defect portion; density distribution in areas surrounding the defect portion; whether the defect portion is present within a principal area of the image; and extent of overlap of the defect portion with the principal area.

16. An image processing method comprising the steps of:

(a) calculating image feature amounts for defect portions in an image represented by electronic information along a plurality of different directions running from within each defect portion;

(b) calculating correction values for correcting the defect portions by interpolation from information through areas of the image for each defect portion for each of the plurality of directions;

(c) determining final correction values for each of the directions based on the image feature amounts in each of the directions; and

(d) correcting the defect portions in the electronic information using the final correction values.

17. An image processing method for correcting electronic information representing an image having a defect portion, wherein the image is recorded on image recording material, the method comprising the steps of:

(a) irradiating the image recorded on image recording material with non-visible light;

(b) receiving the light after irradiation of the image;

(c) calculating a brightness alteration amount for correcting a defect portion in the electronic information representing the image, based on the amount of non-visible light received from the image in the step of receiving, in an area adjacent to the defect portion, and on the difference in refractive indexes of visible light and non-visible light in the image recording material; and

(d) correcting electronic information representing the image so that the brightness of the defect portion in the electronic information changes by an amount calculated in the step of calculating a brightness alteration.

18. A recording medium comprising program steps recorded thereon, which when used to program a computer, cause the computer to execute the following steps:

(a) detecting a defect portion of an image represented by electronic information;

(b) based on a characteristic of the defect portion, selecting a correction method for correcting the defect portion from a plurality of types of correction methods, or ranges of application of each of at least two correction methods for correcting the defect portion; and

(c) applying the selected correction method to the electronic information, or correcting the defect portion by applying the at least two methods to the electronic information in the selected application ranges.

19. A recording medium comprising program steps recorded thereon, which when used to program a computer, cause the computer to execute the following steps:

(a) calculating image feature characteristics for defect portions in an image represented by electronic information, along a plurality of different directions running from within each defect portion;

(b) calculating correction values for correcting the defect portions by interpolation from information through areas of the image in a plurality of directions for each defect portion;

(c) determining final correction values from the correction values for each of the directions based on the image feature characteristics in; and

(c) applying the final correction values to the electronic information to correct the defect portions.

20. A recording medium comprising program steps recorded thereon, which when used to program a computer, cause the computer to execute the following steps:

(a) calculating a brightness alteration amount for correcting a defect portion in electronic information representing an image recorded on a recording medium, based on an amount of transmitted or reflected non-visible light in an area adjacent to the defect portion when non-visible light is irradiated onto the image recording material, and on the difference in refractive indexes of visible light and non-visible light in the image recording material; and

(b) correcting the brightness in the electronic information so that the brightness of the defect portion changes by the amount calculated in the step of calculating a brightness alteration amount.

21. The image processing device according to claim 1, wherein the plurality of types of correction methods comprises a vignetting method in which image information is corrected by reducing high frequency components of a spatial frequency of a defect portion and an area adjacent to the defect portion.

22. (allowed): The image processing device according to claim 8, wherein the final correction value calculation device obtains a final correction value by calculating weighting coefficients for each direction based on a density gradient and a distance between normal pixels calculated and stored for each direction.

23. (allowed): The image processing device according to claim 8, wherein the plurality of different directions from within defect portions radiates outwards from the defect portions.

24. (allowed): The image processing device according to claim 8, wherein the plurality of different directions from within defect portions comprises a plurality of scanning directions and wherein one of the plurality of scanning directions is a straight line in a direction going away from the defect portions and a plurality of the scanning directions are performed in directions 180 degrees opposite each other.

EVIDENCE APPENDIX:

None.

RELATED PROCEEDINGS APPENDIX

None.